

# Active Flow Control (AFC) Design and System Integration Software, Phase I

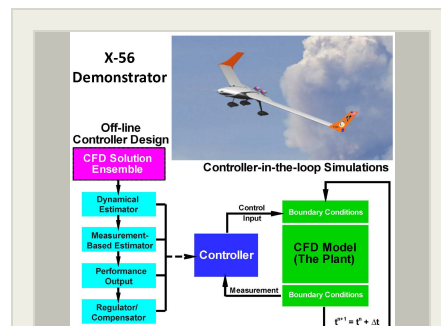
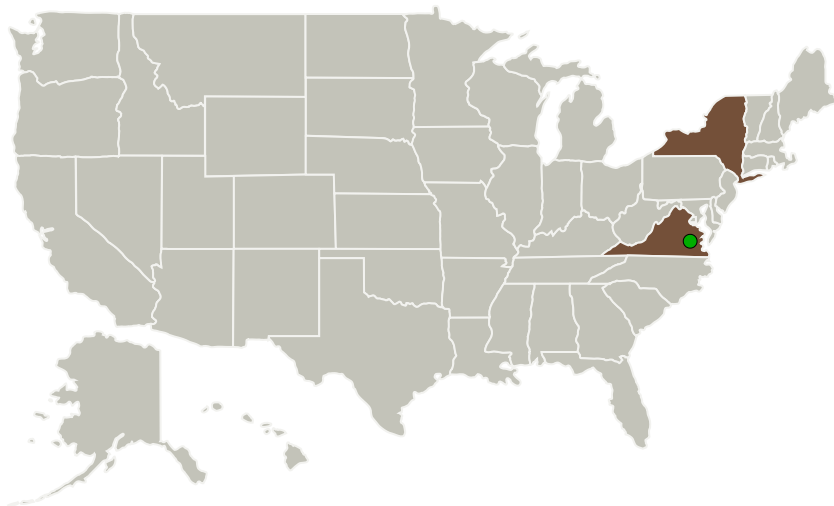
Completed Technology Project (2017 - 2017)



## Project Introduction

Clear Science Corp. proposes to develop and demonstrate computational fluid dynamics (CFD)-based software for designing and evaluating active flow control (AFC) systems on aircraft. The software will facilitate the identification of optimal types of actuation and their locations, will support virtual flight testing with both open- and closed-loop control systems, and will enable quantitative trade studies that compare performance enhancements through AFC to the costs of control. In subsonic, transonic, and supersonic applications, AFC systems can improve air vehicle performance by reducing and/or eliminating separation and increasing circulation---resulting in smaller control surfaces, less weight, lower drag, and less fuel consumption. Many AFC applications involve highly unsteady flow dynamics with turbulence, unsteady shocks, separation, and aeroservoelasticity interacting in complex ways that render open-loop systems either ineffective or too costly in terms of energy, weight, and volume. For this reason, closed-loop AFC system design will be a critical area of focus in the proposed project. Components of closed-loop systems include dynamical and measurement-based state estimators, regulators, and compensators. The proposed AFC system design and analysis software will be developed using the X-56 experimental aircraft as a demonstration platform, a long-range, highly flexible air vehicle currently under development at the NASA Armstrong Flight Test Center.

## Primary U.S. Work Locations and Key Partners



Active Flow Control (AFC) Design and System Integration Software, Phase I Briefing Chart Image

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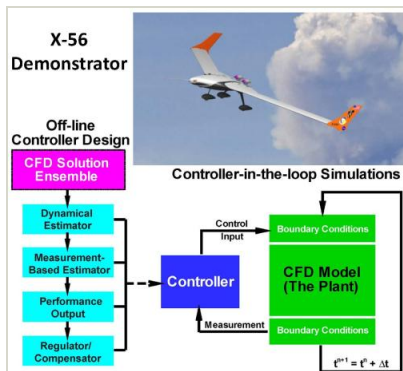


Organizations Performing Work	Role	Type	Location
Clear Science Corporation	Lead Organization	Industry	Harford, New York
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

## Primary U.S. Work Locations

New York	Virginia
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## Images



## Briefing Chart Image

Active Flow Control (AFC) Design and System Integration Software, Phase I Briefing Chart Image  
(<https://techport.nasa.gov/image/131352>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

Clear Science Corporation

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

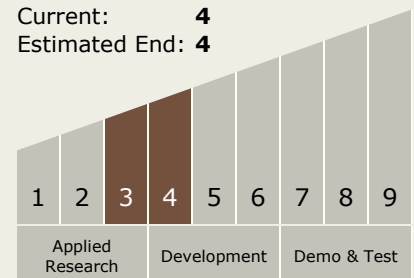
Carlos Torrez

## Principal Investigator:

Henry A Carlson

## Technology Maturity (TRL)

Start: 3  
Current: 4  
Estimated End: 4



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## Technology Areas

### Primary:

- TX15 Flight Vehicle Systems
  - └ TX15.1 Aerosciences
    - └ TX15.1.5 Propulsion Flowpath and Interactions

## Target Destinations

The Sun, Earth, The Moon,  
Mars, Others Inside the Solar  
System, Outside the Solar  
System